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(71) Applicant: **TECNOPLASTICA PREALPINA S.p.A.**
Via Beccaria No 1
I-21049 Tradate Varese(IT)

(72) Inventor: **Fontana, Giuseppe**
Via Zara No 35
I-21049 Tradate Varese(IT)

(74) Representative: **Petruzzelli, Antonio**
Via E. De Amicis No. 25
I-20123 Milano(IT)

(54) Water softener for dishwashing machines.

(57) A water softener for dishwashing machines comprising a ionic resin container (15), a salt container (16) and a vessel (18) for resin regeneration water provided in the form of a single integral unit, in which the water vessel (18) comprises selectable first and second chambers (23, 24) connected at the bottom to the salt container (16) and in which said chambers (23, 24) of the vessel (18) are provided with closable venting means (33, 35).

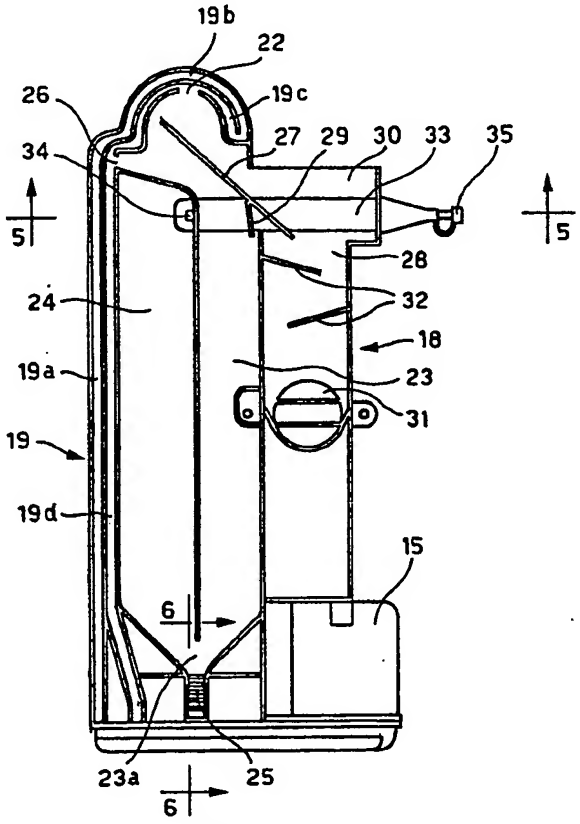

Fig. 4

EP 0 367 062 A1

WATER SOFTENER FOR DISHWASHING MACHINES

This invention relates to a device for softening water for dishwashing machines, and regards specifically a special arrangement and configuration of the container for the ionic resin used for softening the water, of the salt container and of the vessel for collecting the water which regenerates the ionic resin, as well as the conduits which feed the water and interconnect said vessel and said containers, obtaining overall an integrated unit capable of providing several advantages compared to other known systems.

Generally known are water softening devices which comprise an ionic resin container, a regeneration salt container and a vessel for collecting the regeneration water, formed separately from one another; thus during assembling and installation in a dishwashing machine, relative interconnecting tubes have to be fitted which may cause possible water leaks. Moreover the configuration and separate arrangement of the containers for salt and ionic resin as well as the vessel for the regeneration water, lead to greater dimensions and more complex assembling operations.

Therefore an object of present invention is to provide a device for softening water in dishwashing machines in which the ionic resin container, the salt container and the vessel for collecting the regeneration water constitute a structural and functional unit of minimal dimensions designed to provide numerous advantages compared to previously known systems.

More particularly, according to the invention, the conduits for interconnecting the various containers and the vessel for the regeneration water have been provided as integral part of the same unit with the ob vious advantage of eliminating the risk of any water leaks.

A further object of this invention is to provide a water softening device, as specified above having a compact structure designed to facilitate assembling greatly since the device is composed of an integrated unit, complete with all the connecting conduits and passages formed directly in the same structural unit of the softening device. During the assembling the use of flexible bands for fixing the interconnecting tubes is also completely eliminated and consequently possible additional causes of water leaks are obviated.

A further object of this invention is to provide a softening device as related above, by means of which the filling of one or more chambers of the vessel for the regeneration water can be selected by simply opening or closing a venting conduit.

According to this invention a water softening device for dishwashing machines has been provided, said device comprising: an ionic resin container connected to the interior of the washing tank of the dishwashing machine, respectively to a water inlet via a feeding conduit having an arch shaped portion provided with a first lateral aperture defining an air-break for the water; a salt container connected to the resin container by a solenoid valve; and a vessel for collecting the water to regenerate the resin said vessel comprising at least a first bottom opened chamber connected to the salt container, said chamber being furtherly connected to an upper venting hole characterised in that said water regeneration collecting chamber, said water feeding conduits and the respective passages for direct communication between the vessel and the aforementioned salt and resin containers, are provided in the form of a single unit having a plane configuration in which said vessel extends upwardly from and integral with the salt and resin containers, said water feeding conduit being in communication with the regeneration water chamber means of a second side opening positioned after the arch shaped portion; and at least a second supplementary chamber in said vessel, said second chamber communicating at he bottom with the first chamber and being selectively connectable to a separate air venting duct.

A particular embodiment of the water softening device according to this invention is illustrated as follows with reference to the enclosed drawings in which:

Fig. 1 is a sectional view of a generic dishwashing machine provided with a water softening device according to this invention;

Fig. 2 is a front view of the softening device of Fig. 1;

Fig. 3 is a side view of the softening device of Fig. 1;

Fig. 4 is a section of the rear side, seen in the plane of the regeneration water vessel;

Fig. 5 is a section along the line 5-5 of Fig. 4;

Fig. 6 is an enlarged sectional view along the line 6-6 of Fig. 4;

Fig. 7 is an enlarged sectional view along the broken line 7-7 of Fig. 10;

Fig. 8 is an enlarged sectional view along line 8-8 of Fig. 10;

Fig. 9 is an enlarged sectional view along the line 9-9 of Fig. 10;

Fig. 10 is a horizontal sectional view along the line 10-10 of Fig. 2.

Figure 1 shows part of a dishwashing machine 10 comprising a washing tank 11 provided with a rotor having nozzles 12, said rotor being connected

to a pump 13 for feeding the washing water in an usual form. 14 in Fig. 1 indicates as a whole a device for softening water according to this invention, which is partially positioned below and on a side of the washing tank 11. The softening device is shown in detail in the remaining figures.

As can be seen from Figs. 2, 3, and 4, the softening device comprises a container 15 for the ionic resin used to soften the water, and a container 16 for the salt used to regenerate the ionic resin which is connected to the container 15 by means of a solenoid valve, not shown, provided in a seating 17 on one side of the salt container 16.

18 in the figures indicates a vessel for collecting the regeneration water which must be fed to the salt container 16 to form a certain amount of brine required to regenerate the ionic resin in the container 15.

As shown in the figures, the vessel 18 and the containers 15 and 16 constitute an integrated functional and structural unit, together with all conduits or passages for circulating the water.

In particular, the vessel 18 is flat shaped and provided with a conduit 19 for feeding the water, in which the conduit 19 comprises a rising portion 19a connect to the inlet fitting 20, a first arched or arch shaped portion 19b and a second arch shaped portion 19c, concentric and internal to the previous one, which continues with a downwardly directed portion 19d which, via a duct 21 formed in the bottom part of the softening device, communicates with the interior of the ionic resin container 15, as shown in Fig. 7. The second arched portion 19c of the water feeding conduit, on its inner side has an aperture 22 defining, in a manner in itself known, an air-break for the water flow which runs along the conduit 19, before entering the ionic resin container 15 and then the tank of the dishwasher machine.

The flat vessel 18 comprises moreover a first chamber 23 for the regeneration water, and at least a second chamber 24 communicating with the first one and which, like the latter, opens at the bottom into the salt container 16 (Figs. 4 and 6) via a set of openings 25 in the lower part 23a common to the two chambers of the wall wich divides from the interior of the salt container.

The first chamber 23 again opens above and is connected to the feeding conduit 19 by a second lateral opening 26 provided at the beginning of the downwardly oriented portion 19d, i.e. after the arched portion 19c; this opening 26 can be properly dimensioned for example providing it in a plate, not shown, which can be inserted in a seat to enable the vessel 18 to be filled at the same time as the tank 11 of the dishwashing machine.

A slanted baffle 27 is provided between the upper open end of the chamber 23 and the air-break opening 22 of the arched section 19c of the feeding duct to prevent any leaks of water from the opening 22, from entering the chamber 23 by varying or modifying the quantity of water collected in it.

The chamber 23 is further connected to a side venting chamber 28 by means of an opening 29 which defines the maximum level of water which can be loaded in the chambers 23 and 24 for the water used for regenerating the resin. The venting chamber 28 in turn communicates with the outside by means of an upper opening 30 and respectively communicates with the inside of the tank 11 of the dishwashing machine by means of a circular opening 31 for releasing steam. Between the upper opening 30 and the lower opening 31 of the venting chamber 28, fins 32, slanted in opposite directions are formed to define a steam condenser, integrated with the unitary structural assembly of the softening device.

Unlike the first chamber 23, the second chamber 24 for the resin-regeneration water is closed and communicates by means of an opening 34 with a separate venting duct 33, positioned behind the vessel 18; a removable plug member 35 enables the venting duct 33 to be closed or opened respectively so as to prevent or enable respectively chamber 24 together with chamber 23 to be filled.

As stated previously, communication between the salt container 16 and the resin container 15 is controlled by a solenoid valve. In particular, as shown in the details of Figures 9 and 10, the salt container 16 communicates by means of slots 37 with an intermediate chamber 38 having on the opposite side a hole 39 defining a valve seat normally closed by the solenoid valve; in this way the chamber 38 and therefore the salt container 16 can communicate with the bottom of the ionic resin container 15 via an additional conduit 40 and a hole 41 in the base wall of the said container 15. The latter, in the example given in Figure 7, is moreover provided with an upper outlet 42 which protrudes directly into the washing chamber 11 and which is closed by a removable cap 43 having lateral slots 44. Since the level of the water in the tank 11 of the dishwashing machine must never exceed the outlet 42 of the ionic resin container 15, the cap 43 serves as a protection to prevent the dirty water contained in the tank 11 from entering the ionic resin container 15. Unlike the example shown in Fig. 7, where there is a direct outlet for water from the resin container 15 to the tank 11 of the dishwashing machine, the inlet of the water into the tank 11 could be positioned differently and suitably connected by means of a water trap or in some other way to the outlet of the ionic resin container 15.

The water softening device of the invention is finally completed with a device for indicating the

density of the brine contained in the salt container 16, in the form of a device integrated with the structure of the softening device. More particularly, as shown in Figs. 8 and 10, inside the salt container 16 a sump 45 is formed which communicates with the inside of the container 16 by openings or slots 46 in a separating baffle. Inside the sump 45 there is a float 47 comprising a magnet 48 which, as a function of the position assumed by the float 47, in turn dependent upon the density of the brine, actuates or de-actuates a magnetic switch 49 situated outside the container 16, connected to the electrical control circuit of the dishwashing machine.

The softening device operates as follows: on the assumption that only the chamber 23 of the flat vessel 18 is to be loaded, the plug 35 is inserted to close the venting duct 33. When water is fed into the dishwashing machine, the water flows along the feeding conduit 19 and from there, via the lower duct 21, reaches the interior of the ionic resin container 15, where the water is to be softened before being fed or entering the washing tank 11 of the dishwashing machine. At the same time as the tank 11 of the dishwashing machine is loaded, a certain quantity of water passes through the opening 26 of the feeding conduit 19, filling the chamber 23 for the regeneration water, until it reaches the level indicated by the venting opening 29. This water cannot be released into the brine container 16 and thus is released into the resin container 15 since the outlet opening 39 into the container 15 is closed by the solenoid valve. Moreover the water in the chamber 23 cannot enter the chamber 24, unless in a minimal part, since it is prevented by the air cushion which remains in the chamber itself. Clearly, should a larger quantity of water be required for regenerating the ionic resin, the plug 35 only has to be removed to enable venting of the air and thus the filling of both chambers 23 and 24.

The water which may fall from the opening 22 in the arched section 19b of the feeding conduit 19, is deviated by the baffle 27 towards the venting chamber 28 and from there is introduced into the washing tank 11 through the opening 31 on the base.

During the operating cycle of the dishwashing machine, when the resin in the container 15 has to be regenerated, a control signal is given to the above mentioned solenoid valve so that it opens the valve seat 39 enabling the water in the chamber 23 or both chambers 23 and 24 to be released into the salt chamber 16 to cause a given quantity of brine to flow towards the resin to be regenerated. At the new washing cycle the chamber 23 or both chambers 23 and 24 are again filled with the required quantity of water.

From what has been stated and shown in the enclosed drawings it is therefore clear that the invention deals with a water softening device for dishwashing machines comprising a salt container, an ionic resin container and a vessel for collecting the regeneration water, in the form of a structurally integrated unit in which the various component parts are interconnected by means of internal conduits or passages which avoid the use of additional connecting tubes, with consequent advantages as regards operation and assembling. The flat configuration of the vessel for the regeneration water and its configuration of a single part integral with the salt container and with the ionic resin container, provide a structural unit of extremely small dimensions which can be easily assembled by arranging the containers 15 and 16 below and respectively the vessel 18 on one side of the washing tank 11; in this way the water softening device can be assembled extremely rapidly and with the advantage that all the operations usually required for assembling the interconnecting houses and of the relative sealing bands are totally eliminated. Furthermore the adoption of chambers open below in the vessel is advantageous in that it allows the automatic elimination of any trace of stagnant water which in time could cause the formation of algae and substances likely to rot with the result of unpleasant smells.

Claims

1. A water softening device for dishwashing machines comprising: an ionic resin container (15) connected to the interior of the washing tank (11) of the dishwashing machine (10), respectively to the inlet (20) of the water through a feeding conduit (19) having an arched section (19c) provided with a first lateral opening (22) which defines an air-break for the flow of water; a salt container (16) which can be connected to the resin container (15) by means of a solenoid valve; and a vessel (18) for collecting the water used to regenerate the resin, said vessel (18) comprising at least a first chamber (23) opening into the salt container (16), said chamber (23) furthermore being connected to a venting means (28), characterised in that the regeneration water chamber (23) together with the water feeding conduit (19) and the respective passages for direct communication between the aforementioned vessel (18) and the resin and salt containers (16, 15), are in the form of a single unit having a flat configuration in which the vessel (18) extends upwardly and integral with the salt and resin containers (15, 16) the water feeding conduit (19) communicating in turn with the regeneration water chamber (23) by means of a second side opening (26) provided after said arched section (19c); at least a second

chamber (24) being provided for collecting supplemental resin regeneration water, said second chamber (24) being selectively in communication with said first chamber (23) and being connected to a closable air venting means (33).

2. A softening device as in claim 1, characterised in that the chambers (23, 24) for collecting the regeneration water communicate with the salt container (16) by means of slots (25) at the bottom of a side wall (23a) of the container itself.

3. A softening device as in claim 1, characterised in that said chambers (23, 24) of the vessel (18) for collecting the regeneration water are provided with separate venting openings (30, 34).

4. A softening device as in claim 3, characterised in that at least one (34) of the said venting openings is provided in a venting duct comprising a removable plug member (35).

5. A softening device as in claim 1, characterised in that the salt container (16) communicates with the ionic resin container (15) by means of an intermediate chamber (38) provided inside the container itself, and by the fact that the intermediate chamber (38) is connected to the ionic resin chamber (15) via a supplementary conduit (40) comprising a solenoid valve, said supplementary conduit (40) and the seat (17) for the solenoid valve being provided on one side of the salt container (16).

6. A softening device as in claim 1, comprising a device for indicating the density of the brine in the salt chamber (16), characterised in that said indicating device comprises an inner sump (45) communicating with the salt container (16), and a sliding float (47) in the sump (45), said float (47) comprising a magnet (48) for actuating an external magnetic switch (49).

7. A softening device as in claim 1, characterised in that the flat vessel for collecting the regeneration water comprises a steam venting chamber (28) laterally positioned to the water collecting chambers (23, 24), said venting chamber (28) comprising downwardly slanted baffles (32) defining a condensation means for the steam.

8. A softening device as in the preceding claims, characterised in that the vessel (18) for collecting water, at the upper open end of the first chamber (23), comprises a slanted baffle (27) placed between the air-break aperture (22) in said arched section (19c) of the water feeding conduit (19), and the upper open end of the chamber (23) itself.

9. A softening device as in claim 8, characterised in that said separation beffle (27) extends partially in the steam venting chamber (28).

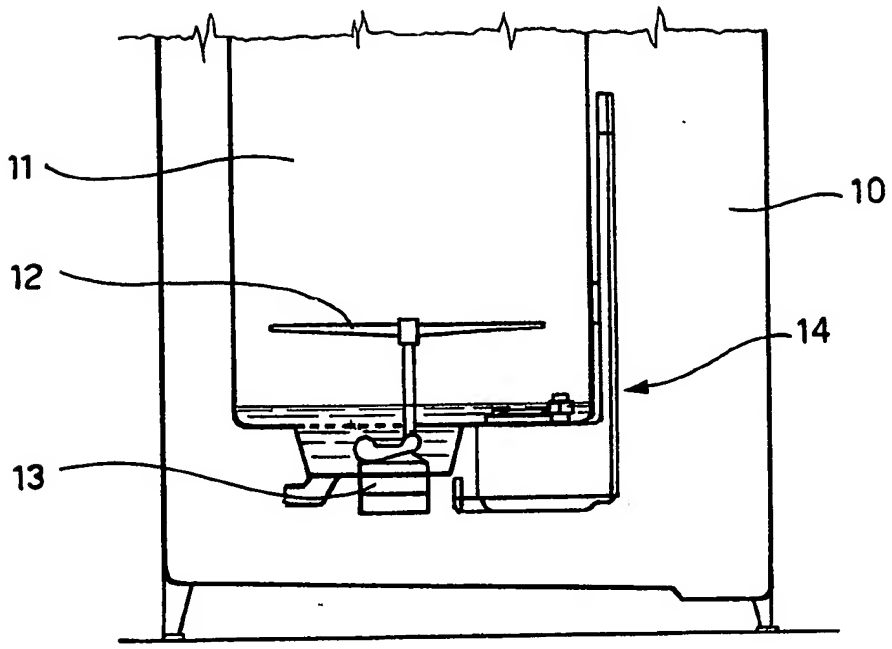

Fig. 1

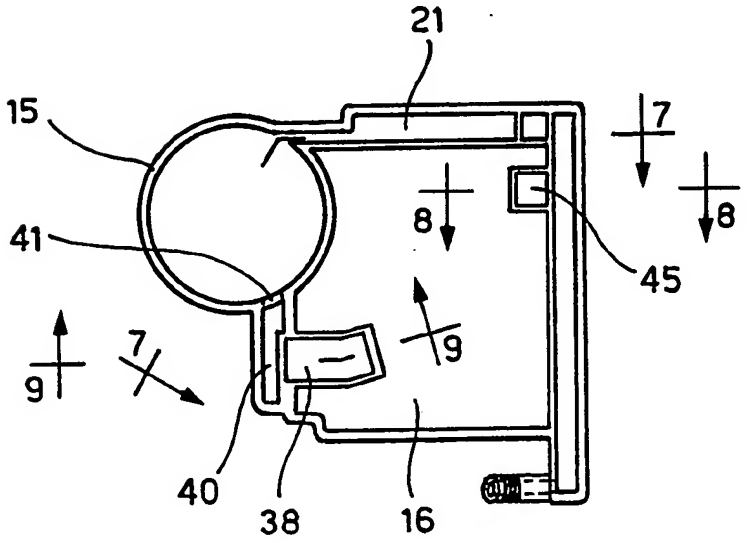

Fig. 10

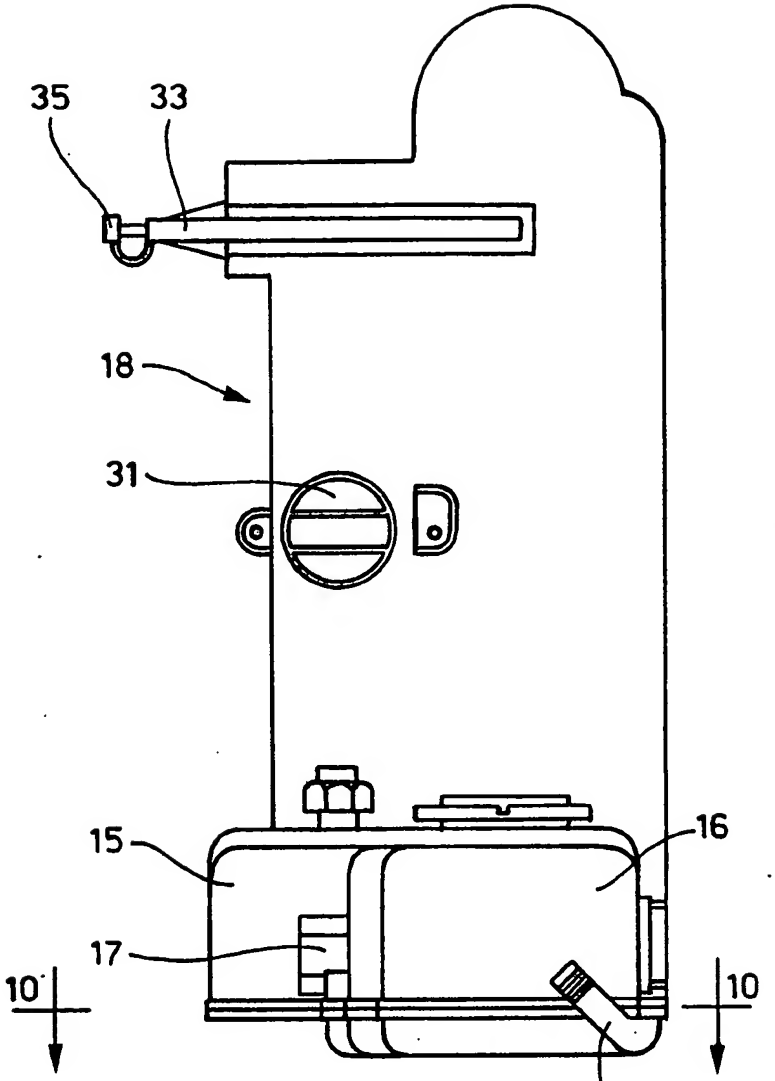

Fig. 2

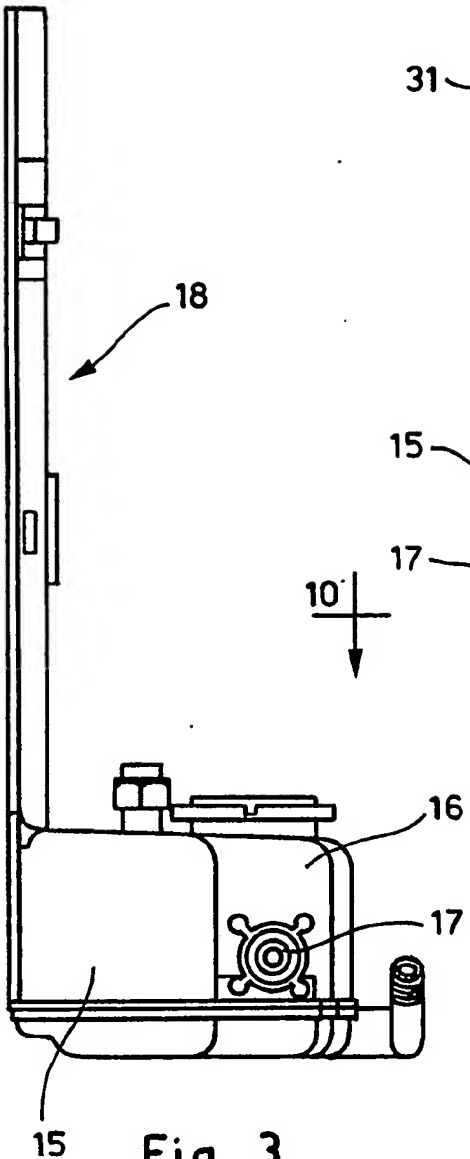

Fig. 3

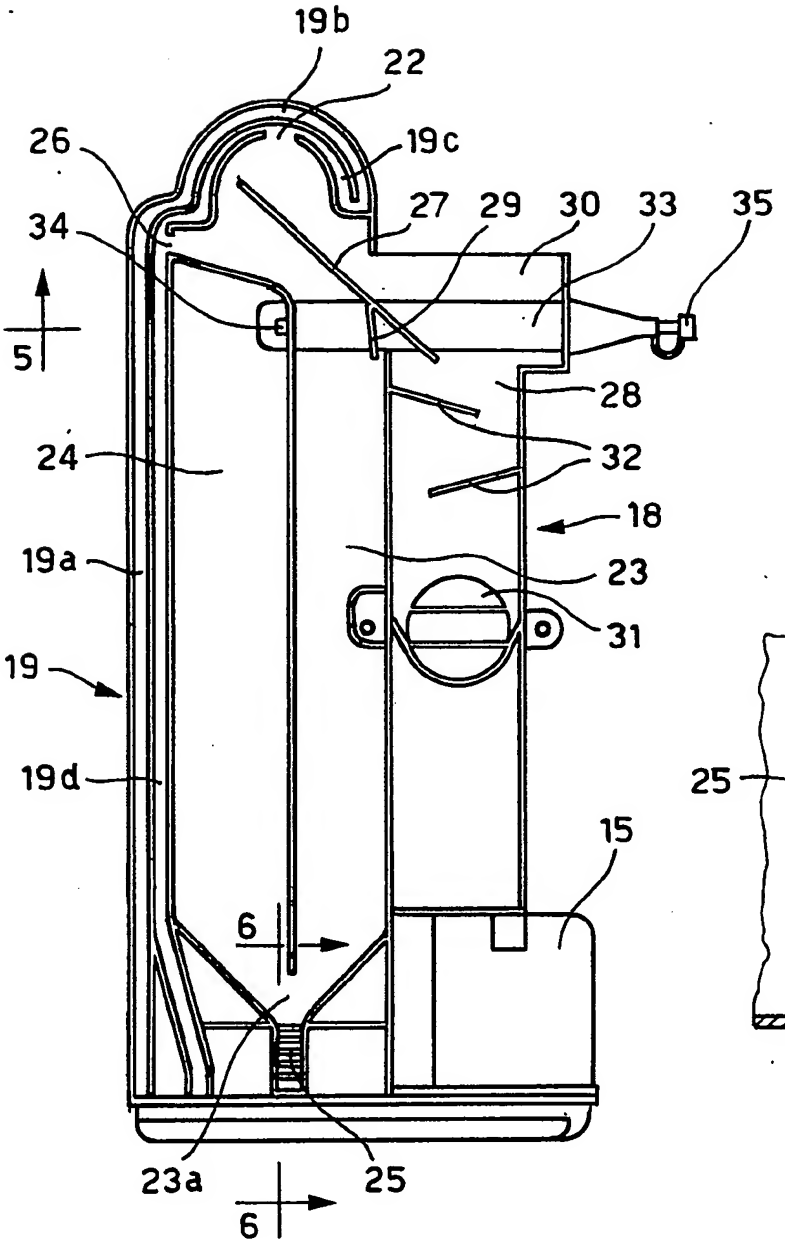

Fig. 4

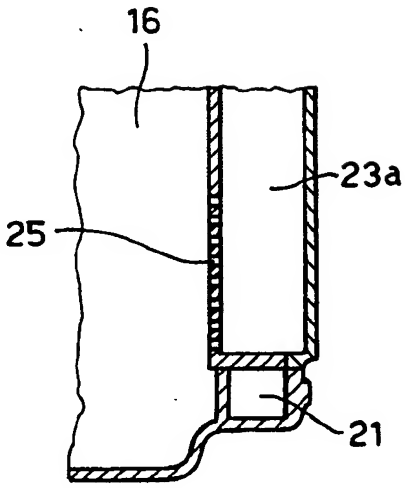

Fig. 6

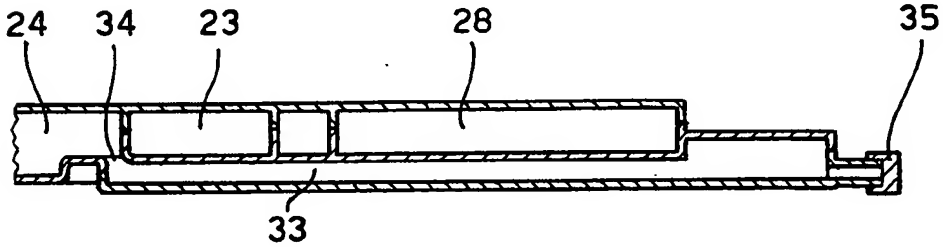

Fig. 5

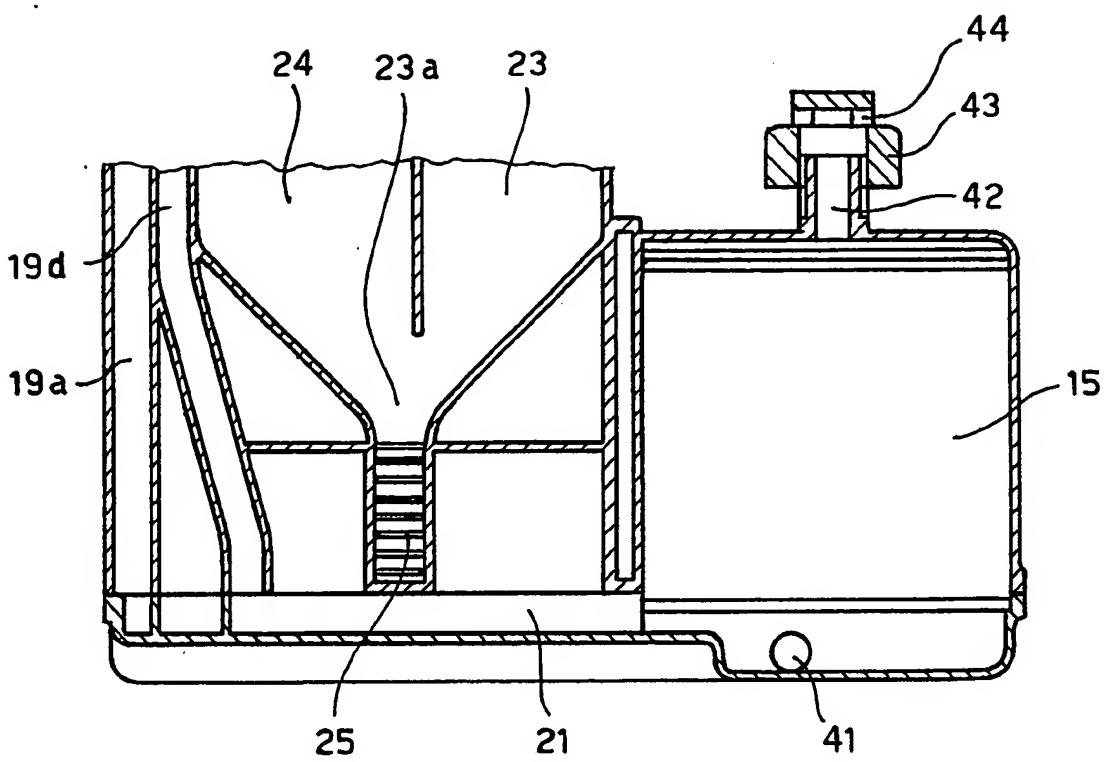

Fig. 7

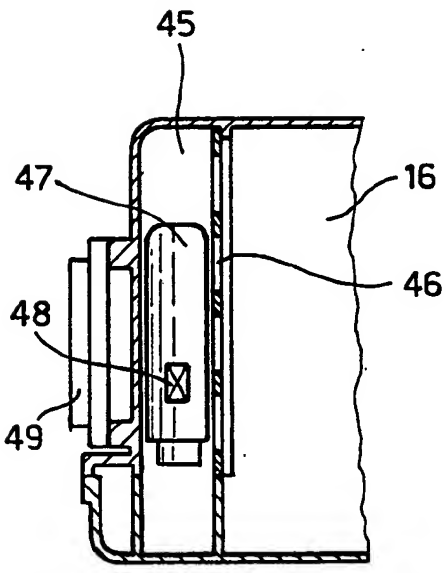

Fig. 8

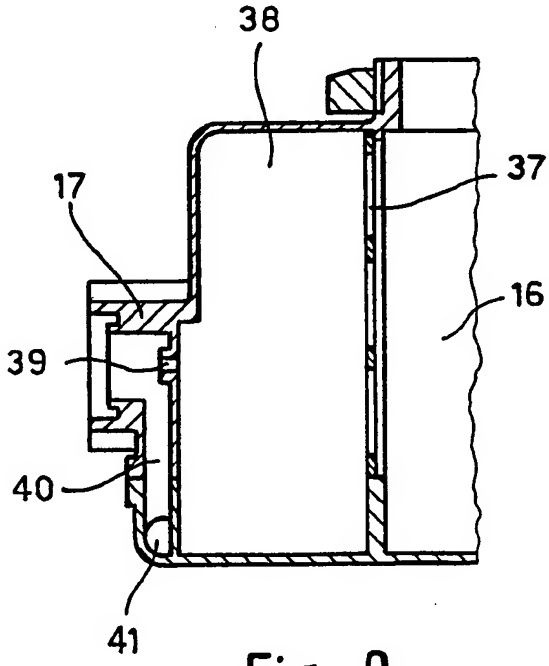

Fig. 9

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EUROPEAN SEARCH REPORT

Application Number

EP 89 11 9620

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int. Cl.5)
A	EP-A-0205788 (BOSCH-SIEMENS) * the whole document *	1	A47L15/42
A	FR-A-2442037 (SCHROTT) * figures 1, 2 *	1	
A	GB-A-2133975 (BOSCH-SIEMENS) * figure 1 *	1	
A	CH-A-513773 (HOLZER) * figures 1, 3 *	1	
A	FR-A-2482442 (SMEG) * figures 1, 2 *	1	
A	DE-C-3239226 (BOSCH-SIEMENS) * figure 4 *	1	
A	DE-A-3345582 (LICENTIA) * figure *	1	
A	DE-A-3209563 (BOSCH-SIEMENS) * figure 1 *	1	TECHNICAL FIELDS SEARCHED (Int. Cl.5) A47L
A	FR-A-2209454 (ELBI) * figures 1, 2 *	6	D06F

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	15 FEBRUARY 1990	SCHARTZ J.

CATEGORY OF CITED DOCUMENTS

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